THE

FOUNDRY TRADE JOURNAL

WITH WHICH IS INCORPORATED

THE IRON AND STEEL TRADES JOURNAL.

VOL. 25. Thursday, January 26th, 1922. No. 284.

PUBLISHED WEEKLY.

Subscription Terms: 15s. per annum.
Foreign and Colonial, 17s. 6d. per annum.
All Subscriptions are payable in advance.

All communications to be addressed to the Editor, or to the Publisher, as the case may be, of

THE FOUNDRY TRADE JOURNAL,
BESSEMER HOUSE, 5, DUKE STREET ADELPHI
LONDON, W.C.2.

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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE
INSTITUTION OF BRITISH FOUNDRYMEN AND THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION

Institution of British Foundrymen.

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Forthcoming Events.

THE INTERNATIONAL FOUNDRY TRADES EXHIBITION,

Bingley Hall, Birmingham,
From June 15 to June 24, 1922.

Institution of British Foundrymen.

Sheffield Branch.—Annual dinner at the King's Head Hotel on January 27.

Newcastle Branch.—Annual dinner at the County Hotel on January 28.

East Midland Branch.—"Foundry Facings," by H. Winterton, on January 28, 1922, at Loughborough.

Gas Cylinders.

The question of gas cylinders has been the subject of an inquiry by a committee set up by the Department of Scientific and Industrial Research. The First Report has just been published by His Majesty's Stationery Office, Imperial House, Kingsway, W.C.2, at the price of 7s. 8½d., post free.

This report is of outstanding interest for foundrymen, for as time goes on the foundries are handling more and more gas cylinders, and thus have a very definite interest in any alterations which may be recommended. Laboratories, cleaning, repairing, and furnace departments all have in turn to handle gas cylinders, and often under conditions which may be described as rough handling. Specifications for the manufacture of gas cylinders were first drawn up by a Committtee appointed by the Home Secretary in 1895 as a result of a serious accident, which occurred at Fenchurch Street Station. This Committee endorsed and amplified the regulations which had been laid down by the Railway Companies the previous year. Since that time no accidents on railways have occurred through the breaking of 0.25 per cent. carbon gas cylinders, but the question arose in 1918 whether the weights of the cylinders could not be reduced, as at the moment the transport of 8.5 lbs. of oxygen or 0.5 lb. of hydrogen necessitates a container weighing about 115 lbs. Obviously if the weights of these cylinders could be reduced considerable economies could be effected in freight charges. This question was of paramount importance during the war, and in 1918 a Gas Cylinders' Research Committee was set up by the Department of Scientific and Industrial Research. Their first report, just published, is divided into a majority and minority report, by Mr. J. H. B. Jenkins (who was the only member of the Committee not signing the Majority Report), and seven appendices.

A number of experiments of a very practical nature have been carried out for the Committee by the National Physical Laboratory, and it is largely on this evidence, coupled with that gained by the Admiralty and War Office, that the Majority Report is based. Briefly the bone of contention between the Majority and the Minority is the carbon content, and its effect upon thickness of section. The Majority were in favour of 0.45 per cent. carbon steel, on the following grounds:—(i) Economy in freight charges, (ii) the success of the N.P.L. tests carried out on this material, (iii) high carbon cylinders have been made in this country for many years and a certain amount are still transported by road, (iv) during the war a large number were safely transported by the railway companies under indemnity by the Admiralty. The specification of the chemical composition recommended by the Majority Report is C. 0.43 to 0.48, Si. not greater than 0.30, Mn. 0.5 to 0.9, S. and P. not to exceed 0.045. The heat treatment, mechanical tests, working conditions and tests on finished cylinders are also detailed. Mr. Jenkins, in his Minority Report, lays stress upon the fact that of the few known accidents resulting from the handling of gas cylinders (which at present contain about 0.25 per cent. carbon), one which came into public prominence was the case of a boy dropping a cylinder at Bradford railway station in 1893, and this cylinder, though of good steel, contained 0.48 per cent. carbon. This, coupled with the fact of the immunity from accidents since the 1895 Report, certainly carries weight. We should certainly be inclined to agree with the Minority Report if the Majority had not laid down very definite heat-treatment specifica-

tion, for obviously there is less latitude in working higher carbon steels. This Report confines itself to plain carbon steels, merely stating that insufficient knowledge is available to allow of the recommendation of duralumin or similar alloys, and that no information has been collected with regard to nickel chrome steels, which are expensive. We rather think that some information is available regarding special steels used for air vessels in connection with torpedo work, which might usefully have been considered by the Committee, because, after all, it does not show much progress, when searching for stronger and tougher material to stop at a heat-treated plain carbon steel, and it is to be hoped that in the future special materials will also be considered.

Points in Die Casting.

BY J. BAILEY.

In the production of screwed parts by die casting an external thread can be cast with a surprising finish and accuracy, although in many cases the mould has to be divided along the centre line of the threaded portion, resulting in a small join mark or fillet of metal at this dividing line, to remove which it is necessary to run a sizing die down the thread. There are cases, however, where this join mark is dispensed with, the die casters unscrewing the casting from the mould. A common error is to assume that die castings are produced, including all small holes already tapped. The most economical way is to produce these with the holes cored tapping size, and for these holes to be tapped afterwards by one of the excellent tapping attachments now on the market. A little consideration will show why this is so. To produce a hole already tapped in the die casting, it is necessary for a screwed core to be unwound from the casting, a comparatively slow job, which might be said to be equivalent to tapping the hole; but as a die-casting machine is commonly operated by two men, one of whom unwinds the core while the other is unoccupied, it certainly does not pay to adopt this method, when, as an alternative, one small boy can probably perform the same operation far quicker under a drill press.

In considering the suitability of a particular piece for production by the die-casting process, attention should be given to the fact that in certain cases, by placing inserts in the mould and casting around or on to them, these may be incorporated in the casting, thus eliminating fastening connections. In such cases it is usual to provide the inserts, which may be of iron, steel, or brass, with means of anchoring in the casting to prevent relative movements of the insert and casting afterwards, this, of course, in addition to the grip obtained through shrinkage of the casting metal. Thus in the case of, say, a steel spindle cast in a bracket, that part of the spindle which is inside the casting when finished should have either a double knurl on its diameter or a few irregular grooves, or even a hole through. This method of casting may also be taken advantage of in order to obtain what might be termed a reinforced casting, where a part has, for example, a projecting shank that would not be strong enough to stand up to its work in the alloys which are ordinarily used in this process.—"Machinery."

Utilising Scrapped Gramaphone Records.

Mr. W. B. Kresge, writing in a recent issue of "The Foundry," states that discarded phonograph records can be used to advantage in repairing old wood patterns, filling crevices, holes or building on patterns. They are used in the manner usually employed when burning in hard shellac with the aid of an alcohol lamp and a warm putty knife. Heat the material over a lamp and force it into place with a warm knife. It cools quickly and when it is hard may be pared to the required shape. Finished with sand paper it is ready to be shellaced with the remainder of the pattern, giving a smooth joint.

MR. A. W. OGILVY-WEBB has been elected a director of Smeeton-Wright Furnaces, Limited, in place of Mr. William Wright, who has resigned.

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Some Principles Underlying Foundry Practice.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I was somewhat surprised to notice in your issue of January 12 Mr. Field recommending "Demosthenes" to use a mixture analysing:—Si, 2.5; S, 0.10; P, 1.0; Mn, 1.0. The castings weighing 1 lb. to 5 lbs. about which "Demosthenes" seeks advice would, I presume, vary in section from $\frac{1}{8}$ in. to $\frac{3}{8}$ in. Surely then it is inviting hard and dirty castings to use iron with 0.10 sulphur; a maximum of 0.06 would be much safer. The high manganese is also likely to cause hard castings; 0.5 per cent. to 0.7 per cent. would give much better results.

Nor is there any necessity for "Demosthenes" to use such expensive pig-iron as Scotch and hematite (although I am aware hematite is *at present* very little dearer than common foundry pig).

An ideal mixture for this work would be:—Si, 2.5 to 3.0 (dependent on section of metal); S, not over 0.06; P, 1.0 to 1.4; and Mn, 0.5 to 0.7 per cent. can be produced by using pig-irons (which can be bought at the same price as common foundry pig-iron). Mixed with as much as 60 per cent. of scrap, this will give a fast-machining iron which, melted scientifically in the cupola, has an ultimate tensile strength of 11 to 12 tons per sq. in.

For these thin sections it is very necessary to melt almost white-hot (at about 1,400 deg. C.) so as to enable the metal to be carried a distance in small hand shanks.—Yours, etc., J. A. R.

Manufacture of Ingot Moulds.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Could any of your readers throw any light on the following?—

It is generally understood that hematite pig-iron must be used entirely in the manufacture of ingot moulds, owing to the fact of its heat-resisting qualities. It would be interesting to know what the particular constituent is that necessitates hematite being thus favoured.

Hematite is a high-priced iron compared with ordinary pig, and if some of the manufacturers would experiment, it seems feasible that either a smaller quantity of hematite, together with some other quality of pig-iron or steel scrap, or a mixture of ordinary iron and steel scrap might produce an ingot mould which would give a satisfactory life.

If this could be done considerable saving might be effected. For instance, if we consider an ingot mould of 10 tons weight, this would require, say, 12 tons of liquid metal. At 125s. per ton this would cost in the Sheffield district—

12 tons at 125s. per ton	£75 0 0
Suppose we use 4-5 of this amount equals	60 0 0
and 1-5 steel scrap equals	4 16 0
	£64 16 0

This would effect a saving of £10 4s. per mould in metal value

Whilst hematite moulds have been known to last an average of 90 to 100 heats, others again have cracked during the first few heats, so that it is necessary to look farther than the particular brand of iron to find the cause of this failure.

During the war hematite pig became very scarce, precluding its use for anything other than steel manufacture or furnace work, and it would have been a great saving to everyone concerned if some other mixture on the above lines could have been developed.

On the other hand, the steel manufacturer claims the scrap ingot mould, if made entirely of hematite, to melt up in the open hearth furnaces. If any other mixture were adopted the scrap ingot mould would still have a value.

A suggested analysis of material for this purpose is:—Si., 1.6; P., 0.22; Mn., 0.9; and S., 0.05 per cent.

Probably this question will resolve itself into another problem for the attention of the B.C.I.R.A.—Yours, etc., Q. E. F.

Braintree Castings Company.

The Braintree Castings Company is the modern development of a small iron foundry which was laid down some 16 years ago to meet the demand for castings of Messrs. Lake & Elliott, the output of the foundry being approximately 3 tons per week. Some two years later crucible furnaces were built and steel castings were made up to 1 cwt. in weight. The crucible furnaces had speedily to give way to the electric furnace, the Héroult furnace put down being, in point of fact, the first electric furnace in this country to be used for the production of steel castings, and it is worthy of note that at this time the current for the furnace was supplied by a gas-driven generator.

To meet the increased demands upon the foundry the company, in 1916, put down two 10 cwts. stock converters, and this installation was followed almost immediately by the laying down of a Tropenas plant. The whole of the additions referred to had been built round and into the original foundry. At the time in question the arrangement was not a matter of choice but of obligation, naturally however it was not conducive to systematic and economic production.

Whilst the plant was maintained in operation the works were entirely remodelled. A central power station was built and equipped, and three 2-ton electric furnaces (Electro-Metals, Limited)

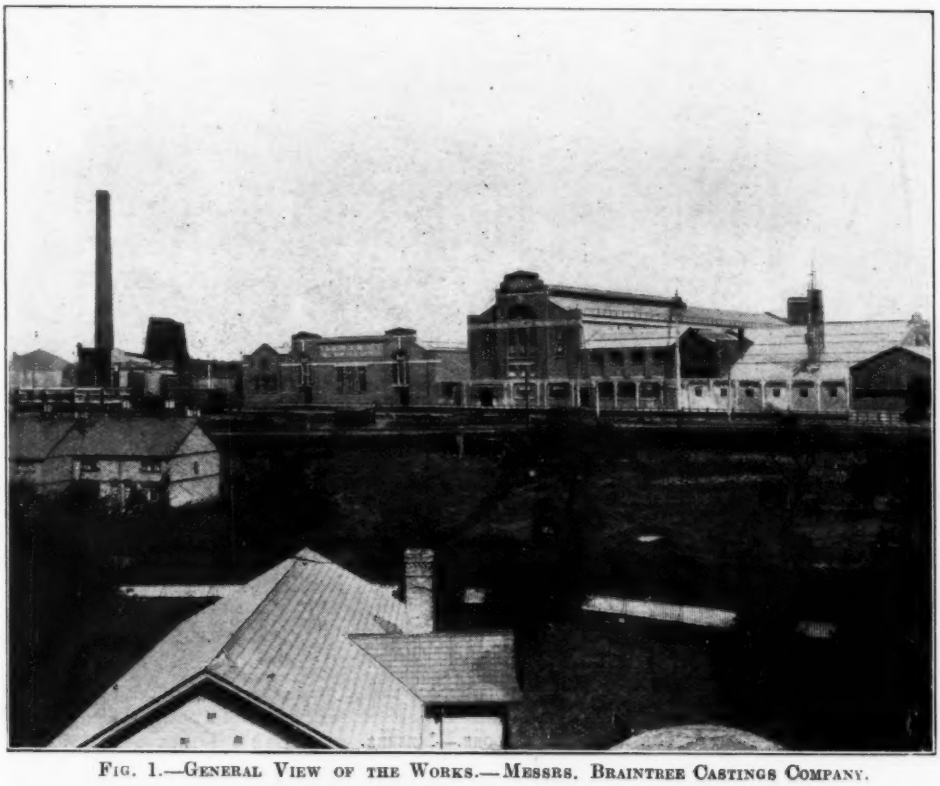

FIG. 1.—GENERAL VIEW OF THE WORKS.—MESSRS. BRAINTREE CASTINGS COMPANY.

FIG 2.—THE THREE ELECTRO-METAL MELTING FURNACES.—MESSRS. BRAINTREE CASTINGS COMPANY.

were installed, which work was carried to completion in 1917, when the whole of the old plant was dismantled.

The new works were planned to reduce transport to a minimum, and the raw material (steel scrap) is only moved a matter of 100 yards, and always in one direction from the time it is unloaded in the storage bins until it again reaches the railway wagon in the shape of finished castings.

The main production of the company is castings for the automobile industry. The demand, however, for pressure castings has led them to specialise in this direction and large quantities of such are now made up to weights of 20 cwts.

The sand is handled by a patented system, the invention of the managing director, Mr. W. B. Lake. In the first place it may be noted that the whole of the old sand is re-used, and only the make-up supplied in the form of fresh sand.

The new sand is delivered by rail and discharged direct into the storage bins at the rear of the sand shop. After the necessary mixture of old and new

FIG. 3.—ONE OF THE MOULDING FLOORS.—MESSRS. BRAINTREE CASTINGS COMPANY.

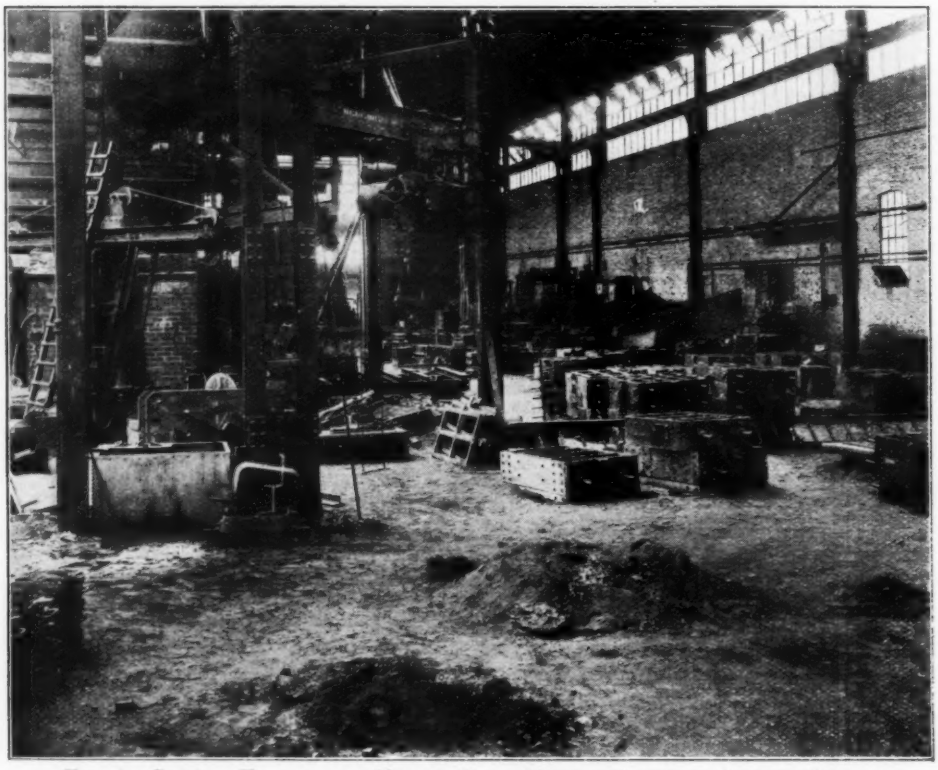

FIG. 4.—GENERAL VIEW OF THE MELTING BAY.—MESSRS. BRAINTREE CASTINGS COMPANY.

sand has been made the whole is passed through a Thwaites dryer which has a drying capacity of 20 cwts. per hour. From the dryer the sand passes over a screen, to remove the rough material, nails, etc., the through sand, falling into a conveyor pipe system, is delivered by compressed air to an elevated hopper into the bottom of which hopper the heavier material (the good sand) falls, the light material is air-borne through the pipe system to the waste hopper. The sand from the hopper is delivered down shoots into the measuring buckets which are over each of the three mills. The mills are engaged respectively upon dry, green and core sand. The mills and the Thwaites dryer are belt driven by a 25-h.p. Crompton motor.

The fine skin and exceptional soundness of the castings afford conclusive proof of the sand plant.

FIG. 5.—VIEW IN THE CLEANING DEPARTMENT.— MESSRS. BRAINTREE CASTINGS COMPANY.

FIG. 6.—VIEW IN THE POWER STATION.— MESSRS. BRAINTREE CASTINGS COMPANY.

The foundry floor is covered by a main bay (the casting bay) 244 ft. by 59 ft., the floor being served by three 5-ton Heywood electric cranes.

The three electric furnaces are installed in this bay, normally two of these furnaces are in operation and one laid off for repairs. It is worthy of note that in ordinary practice a furnace will bring

down 200 tons of metal between patchings. The moulding and service bays are at right angles to the casting bay. In one of the side bays the ladles are heated by pressure gas.

The two machine-moulding bays are each 83 ft. × 30 ft. and 28 ft. wide respectively, and they are separated by a service bay. The machines installed consist of five hand-ramming machines, upon each of which there is a normal output of 50 boxes in eight hours, four Britannia jolt-ramming machines, three Tabor turnover machines and a special Britannia machine with a 4-ft. square table; this machine is served by a revolving crane and three stand tables, an arrangement which allows of eight men working at the machine simultaneously.

There are three bays devoted to hand moulding which are 59 ft. × 93 ft., 29 ft. × 108 ft. and 29 ft. × 122 ft. respectively, and in the last two there are a 5-ton Royce and a 3-ton Royce cranes. The progress and costing offices occupy a building at the end of the foundry, and adjoining are the photo room and an extensive pattern stores.

From the foundry the castings are taken by bogie trucks into the fettling shop, the line of track running parallel with a battery of four Tilghman's sand-blast rooms. Leaving these rooms the castings have the risers removed by the oxy-acetylene cutting process and thence pass to the grinders of which there are 10 double-headed and one special machine, the grinding member of which is mounted upon a turntable and longitudinal base; this machine is driven by a separate motor. At the end of the fettling shop opposite to the sand-blast rooms there are cubicles for electric welding.

The annealing shop adjoins, and here are installed four Brayshaw gas-fired annealing furnaces; Cambridge pyrometers are installed, and all castings are brought to a temperature of 900 deg. C. The castings then pass to the final inspection and despatch department.

There is an efficient laboratory and testhouse, the latter housing a 10-ton Dennison machine and a Tangye 20-ton machine for bending tests.

Pieces on test at the time of our representative's visit gave 29 tons per sq. in., and 34 per cent. elongation; he was, however, informed that this result is their every-day practice.

The pattern shop contains the usual complement of circular saws, band saws, lathe, drilling machine, etc. It will, of course, however, be understood that for the most part customers send their own patterns.

The power-house, served by a Herbert Morris 15-ton crane, is a roomy and very nicely-finished building with a parquet floor, the walls lined for 5 ft. with glazed tiles, and finished with colour. The power plant comprises two B.T.H. 1,500-kw. turbo generators, 6,600 volts, 50 cycles, three-phase 3,000 r.p.m. Belliss B.T.H. 100-kw. set, 400 volts, and a Parsons' turbo-blower 2,000 c.f. per min. at 30 lbs., 6,000 r.p.m. The sets exhaust into Cole, Marchent and Morley condensers. The switchboard is housed in a side gallery, a Tyrrell regulator is in service, and this, despite the heavy fluctuations incidental to the electric furnace, has never failed in its functions.

Steam is raised in three Babcock & Willcox boilers, each 18,000 lbs. per hour at 200 lbs. w.p. superheated to give 550 deg. Fah. at the engines' stop valves. The boilers are fitted with Green's economisers and fired with Babcock chain-grate stokers and Bennis elevators. A Lea coal meter is in service, and provision is made for testing the coal consumption of any of the boilers. Weir feed-pumps are installed. Water is drawn from a well by air lift of a capacity of 12,000 gallons per hour. Two motor-driven pumps capable of delivering 3,000 gallons per hour act as standby to the air lift.

The boiler stack, 180 ft. high, is, owing to the nature of the ground, carried on 24-30 ft. concrete pillars, whilst the power-house is built on a concrete raft.

Current is taken from the central station to the various sub-stations at 6,600 volts.

The main sub-station, which adjoins the electrician's shop, houses a 750-k.v.a. transformer 6,600 to 400 volts A.C., two Crompton motor generator sets each of 100 kw. for D.C. supply Belliss single-stage air compressor 200 cub. ft. at 100 lbs., Alley-Maclellan compressor 500 cub. ft. at 100 lbs., and the two Pulsometer pumps which standby to the air lift.

Water and the Foundry.

BY NEVILLE DEANE.

On first thoughts, water appears to have little connection with the foundry, except that it is a suitable medium for damping moulding sand, but on consideration it will be found to play a part in many directions. An interesting case in connection with water arose in a hollowware foundry some time ago. It was found that castings left in the shop overnight developed a plague of rust-spots, and not only that, but castings which had been sand-blasted and left untinned also showed the spots, and had to be done over again. Many theories were advanced as to the cause, such as a mysterious "something" in the iron, the sand, the air, etc., especially when it was discovered that the spots did not appear if the articles were kept in a dry atmosphere. Eventually, after investigation, it was found that the water supply for damping the sand was drawn from tubs containing the water passed through the cooling jackets of the gas engines, which, in its turn, was pumped from a well in the yard. This well was found to contain a very large amount of chlorides, both lime and ammonium, and this was traced back to the drainage from the tinning shop, where both hydrochloric acid and sal-ammoniac were in use. A well was opened up in such a position that no such drainage could occur, and the rust trouble soon vanished, thus proving the contaminated water to be the source of the difficulty.

All foundrymen will know the ill-effect of a leakage of rain-water through the roof on to a finished mould, and will consider themselves lucky to escape without an explosion. It is not everyone, however, who realises that the habit of dripping water on to a mould of a fine pattern to make the sand hold-up whilst withdrawing the pattern, may have a similar, though modified, effect, and that the added water also has a chilling tendency, and may produce a casting with a very hard surface and useless for machining. This is particularly the case when the iron has been mixed with a view to producing a tough, fine-grained casting. Water in a core is another fruitful source of spoilt castings, and may arise from the cores being left in the damp moulding sand for too long a period before casting, thus causing "blowing" defects. If this delay is unavoidable, then an oil-sand, or similar mixture, should be used, since these cores are practically damp-proof.

Another "moisture" difficulty which arises is in connection with the cupola. Coke is generally left in the open, with the consequence that its moisture content varies from day to day. Now since the moisture has to be evaporated, it follows that it is not only useless, but also a source of inefficiency, since it will absorb heat. Therefore, on a wet day, either the iron must be cooler or more coke must be used than on a dry day. The coke is not the only culprit, since the air itself is a moisture-bearer, and will carry into the cupola many gallons of water on a wet day with a subsequent cooling effect. One can hardly see how this is to be avoided without an expensive drying plant, but any cupola-man will bear witness as to the trouble it causes and the necessity for extra fuel.

Among miscellaneous effects of water might be mentioned the alternate shrinkage and expansion of ropes and consequent derangement of lifts, etc., the risk of electric shocks and short circuits from wet wires, and the annoying delays to outside work caused by wet weather.

American Valuation of Imports.—The Trade Information Committee of the American Chamber of Commerce in London has issued the following:—The conclusions reached by the American Chamber of Commerce in London, in whose deliberations American members alone vote, are based upon the belief that the American valuation of imports for the purpose of assessing *ad valorem* duties must inevitably be a handicap to the freest possible exchange of goods, which is not only in the best interests of both countries, but is essential to the restoration of their mutual prosperity. In the view of the Chamber, if the proposals are adopted, it will be next to impossible for American importers to ascertain the complete cost of purchases made abroad until received in the United States, when further complications would almost certainly arise from long-drawn-out Customs disputes. It is equally difficult to see how foreign shippers will be able to make the c.i.f. or "delivered" quotations, which American houses have found it expedient to call for in the past.

Industrial Training for Foundry Workers.

By Thos. Vickers, C.E., Secretary of the British Cast Iron Research Association.

(*Continued from page* 44.)

A Technical School Failing.

Destructive criticism of technical educational system is one of the commonplaces of the present time. But it should be remembered that education has two functions. On the one hand, it has to furnish the student with information, and seeing that the extent of information which the student has acquired can be tested more readily and more certainly than other qualities, this function of education is too often taken to be the whole or the most important part of it. As a fact, however, the information a boy gets during his school days is probably the least important result of his education. The school's business is much more to teach a boy how knowledge should be acquired, than actually to make him acquire it.

When this is borne in mind, it will be seen that the most important things technical education can do for a boy is to give him practice in observing the materials with which he has to work, in making a job of whatever he does, and in facing and overcoming difficulties for himself, and if technical schools adopted this principle a different class would be found even in foundries. Great importance should be attached to the technical school foundry classes as being the foundation upon which we can build any sound scheme for the future improvement of foundry labour.

Meeting Foreign Competition.

There is not the least doubt that competition in the future is going to be keener than ever experienced by the oldest foundry. Foreign competition has now to be faced by the most modern foundry plant and equipment, and it requires all the help possible from the technical schools to assist in meeting it.

The training of the employé does not mean only apprentice training, but the training of the foreman and the executive as a whole. Some guiding rules can be laid down for the consideration of that industry. Men should be taught:—

Firstly.—Why it is not fair to do less than their best. This implies knowledge on the part of the men of possible losses to be sustained through poor workmanship.

Secondly.—How they can give full value with the least expenditure of effort on their part. This implies knowledge on the part of the men of methods and reasons.

Thirdly.—They should be taught wherein lie the interesting points of the work they are doing. This implies knowledge on the part of the men of processes beyond those with which they are immediately dealing.

And, fourthly.—Every workman should know or be told what he is doing.

What does this last apparently simple item mean?

Interesting the Workman.

As a rule, the ordinary workman knows very little about the inside working of the shop in which he works, and very little, if anything, about any other shop. As a natural result, continuity of operation is secured principally through blind obedience to orders, and not to any intelligent conception of the effect of one shop's work upon that of another shop, nor has he a clear understanding as to what the works manager is really trying to accomplish. It is a true axiom that no job was ever done less efficiently because all the men who worked upon it knew the reason for what they were doing. Men should be taught to see the end of the process as well as the beginning. Each man should be taught to realise his own personal responsibility in connection with the condition of the finished product.

Every workman, who is taught and approached in such a manner that the matter interests him, it will appeal to him, and it will not depreciate the work he has to do.

The Effect of Design.

There is a further aspect of this question which is worth consideration. If by industrial training the improvement of the practical knowledge of the worker is meant, he will therefore be able in many ways to avoid the enormous waste of man-power at present involved in making castings. Many of the so-called troubles in foundry operations are due to faulty design, many cases of which have recently come to light. Automobile engineers and foundrymen, by co-operation, have made it possible to produce complicated castings in great quantities at a low cost. But is this so with all other engineers? They are responsible for the design of large castings, but the design of some of these requires a core so large and heavy that it cannot be supported by the available core print, and if it can be supported, the removing of the core after the mould is poured presents unlimited difficulties. Very often in the engineer's design are found recesses, sharp corners joining thin and thick sections of metal, and similar unnecessary items. All these retard production and prevent the use of machine moulding, requiring instead the greatest manual skill to secure even a low production. Here the trained foundry employé can use his knowledge and endeavour to convince the engineer as to the necessary alterations.

The American System.

It is not intended to submit any cut-and-dried scheme, but it is worth while to consider the American training scheme, which comprises classes for all grades of men, including foremen. They recognise that the difference between the skilled work and unskilled work lies not so much in the requirements of the product as in the training of their executives. In competition for trade the foundry that has the least waste in methods and material will be the one that will succeed, and to ensure this all hands should come under this scheme.

Herbert Gray's book on the "Eclipse of Empire" is worth a careful study from all foundrymen. Gray shows quite clearly and forcibly that this country has attained a position wherein it is no longer the industrial and mercantile leader of the world, and shows that this decadence is due primarily to the neglect of recognising the necessity of a democratic educational system founded on a scientific industrial basis.

Startling as this statement may appear to be, yet we have to recognise the truth of it. The author is of opinion that to-day fully 70 per cent. of the proprietors of our foundries are inexperienced in many of the details of foundry work. As the men they employ become scarce, they have not the ability to teach new hands how to do the various work.

All foundrymen are responsible for the industrial education of those under their control. During the few years in which one is in the schoolroom one learns principally *how to learn*. The actual, most valuable, and most usable education comes after one has entered the shop.

It is said that the growing scarcity of skilled moulders is partly responsible for the development and introduction of the moulding machine. Nevertheless, there is a limit to the provision of substitutes and makeshifts for skilled artisans, and industrial training should include other things besides the routine foundry work; there should also be instruction on safety work, welfare work, sanitation and fire prevention, all of which make up the daily round for improving the amenities and safety of the worker.

The Apprentice Question.

Why do boys who have passed through higher schools object to learn the foundry trade? Various reasons are given. Amongst others, there is the boy who objects to a trade in any shape—a trade or a business—and by this all forms of endeavour is included, just as much as law, medicine and such like, and as such demands a preparation just as vigorous, if not more so.

There was a period when a certain grade of school authorities looked upon business as a sordid, subordinary occupation for those of

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mediocre mentality; this, however, is being gradually dissipated. This is not quite the educationist's fault; he has been giving what the parent has demanded for his son—a polish of mental activity.

A generation ago boys considered it a privilege, and gladly paid to learn a trade; to-day premiums and other inducements are offered to encourage them to the workshop. What is the cause for this apathy on the boy's part?

First, it should be recognised that the character of the working classes has changed, and the conditions of living, both social and economic, altered.

If the period about the middle of the last century is studied, it will be found that every man then was expected to work, and he did work. The indentured system of apprenticeship with a full day's work and seven years' service insured a thorough grounding in the principles and practice of the trades. It was then the rule that a boy started at his trade at an early age, to-day the law states that the longer one waits to start the better off one will be, and parents seem to think that education spells "work eliminated."

Another reason is the increasing use of machines. Some employers have said: "We don't need skilled men, but we want operators," and to make apprenticeship less desirable, higher wages are an immediate inducement to the operator.

The American Ideal.

In America the idea upon which the plan of teaching is based lays stress not so much upon the development of manual skill in the moulding operations, nor primarily upon a knowledge of the practical details involved in the mechanical production of moulds, but rather upon the development in the perspective by the student and of an appreciation of the broad executive and administrative problems involved in the commercial conduct of a foundry. With this thought in mind, attention is given to organisation, scientific planning of production and accurate time study. The laboratory courses approach as much as possible commercial realities.

It is often said: "It takes time to train green boys, and as soon as one has been trained he leaves." However, a systematic plan of apprenticeship entered into seriously with terms just to both the employer and the boy and with sufficient guidance from the foundry manager, will bring results that will outweigh all objection, and, as a consequence, the whole industry will profit.

But is it a disadvantage to have good men go out to other foundries after completing their apprenticeship? It is really the best experience a man can have. By going into different shops his knowledge and his outlook are widened, and possibly he will return later to his first shop to become a valued worker.

If foundry managers gave more attention to the boys under them, get acquainted with them, make their work interesting, put the stamp of their own personality upon them, and impress upon them that future skilled workers were selected from them, they would put better efforts forward to secure such positions.

One of the supposedly important features of progress during the past 25 years in the foundry is known as specialisation, but specialisation, like many other seemingly good things, has its limitations and its great drawbacks, chiefly monotony, and it is at last beginning to be realised that specialists are not thorough in mechanics, and it is very detrimental to the employment of apprentices.

The industry is therefore faced with a problem of the utmost importance. It does not matter whether the present condition of lack of apprentices has been brought upon us by the desire of the employer for increased production or decreased cost, or both. But unless the foundry is made more attractive to young men and an efficient system of training is adopted, there will be very few capable all-round moulders in the next generation.

An American writer recently said that for purpose of comparison many foundry apprentices could be divided into three general classes—those who are physically lazy, those who are mentally lazy, and those who are lazy in both body and mind.

Judicious and well-applied supervision will, however, develop the members of the first class, and make them fairly competent workmen. Ambition, which may be lying dormant and susceptible to a slight spur from an outside source, may be the means of developing an apparently mentally lazy individual into a human dynamo. Even those who are both physically and mentally lazy possibly fill a gap in the general scheme of industrial life, for we shall always require hewers of wood and drawers of water.

But the tendency of foundry employés to discourage apprentices must be overcome through education. How many sons of moulders or foremen do you find in foundries? Many employés sincerely and honestly discourage boys because they labour themselves under insanitary and unsafe conditions. There are also others who discourage them because of selfish motives. Cases have been known where moulders discouraged apprentices to keep down the number of available moulders.

There is no doubt also that many boys are discouraged after a short time from the fact that the foundry proprietor is unable to master their training problems, chiefly due to lack of knowledge of the subject, and the boy is left to the tender mercies of an overburdened foreman, or someone else incompetent to teach him.

Some Selected Schemes.

There are several firms in this country who have now formed schemes for their young workers—the principle adopted by the Davis Gas Stove Company is universal, namely, the boy takes a graduated course for five years, with a total of about 550 hours.

When boys are taken on, they have to make a promise that in the event of being physically fit for this class of work, they continue at it until they are proficient. They are then put under a working foreman or instructor, where they are taught and receive practical experience of the first stages, and continue in this group until the instructor considers they are proficient enough to enter on to the second stage. They are then transferred to another group, also under a proficient working foreman or instructor, where they are practically put on work on their own account, but under the instructor's supervision, until, in his opinion, they are able to proceed entirely on their own account.

Up to this time, they are paid at a progressive day's work rate, but on becoming thoroughly proficient, they are placed in a row of their own to make a simple light class of work at piece rates arranged to suit, not only the class of work, but also to suit their experience, while giving them an opportunity to earn a wage somewhat in excess of what they would with their experience and age be entitled to at day's work rates. Then, as they gain experience, they gradually progress towards the work and rates paid to proficient, experienced moulders.

The Metropolitan Vickers Scheme.—This is a very comprehensive one, and includes a works school of 2 to 4 hours per week during work hours and without loss of pay, and periodical examinations are held. Foundry lectures are given to the apprentices each year, upon which the boy has to write a short essay.

The B.T.H. Company, Rugby.—This firm were one of the first to recognise that the training of youths was essential to avoid the too prevalent tendency to drift into "blind alley" occupations, and their system of apprenticeship covers five years, and the boy receives a thorough training in all grades. He receives pay and also an annual bonus.

Details of the American System.

The American co-operative system is a plan worthy of consideration in this country. The employment of technical high-school students on a half-time basis offers an opportunity to compare the relative advantages of the co-operative system with regular apprenticeship. The co-operative plan is that of one week in school and one week in the shop, provided by pairing boys so that while one is in the plant his alternate is in school. It will be seen that there is no tendency to displace regular apprenticeship by this system.

On the whole the co-operative plan seems to work better in the case of draftsmen, who cannot well obtain too much technical and general education, and it does not, in that case, offer any serious difficulty if one member of a pair of alternates drops out. This is a more serious matter in the case of foundry boys, because with a well-laid-out system of progress through the shops it is not desirable to pair one boy who has, let us say, advanced to a third or fourth year of the course with one just beginning. It is not the opinion of experts that the co-operative students were likely to advance ultimately more rapidly than regular apprentices by reason of their more extended general education, though they appreciated the value of the good general education attained by the longer continuance in school.

The general reports from American foundries show that a sound national system of apprentice training has been adopted. This provides that in each foundry a variety of work is carried out during working hours under the direction of instructors. The work is of such a character as will tend to preserve the balance in the training of the head and hand.

A boy to be eligible to serve an apprenticeship must be between sixteen and eighteen years of age, and have had a good common school education. A point on which special emphasis is laid is that boys should be inclined to have a natural perception of foundry matters. A preliminary examination is usually given to show how much knowledge the boy has. The first twelve weeks of the apprenticeship constitute a trial period, during which the boy is paid. If accepted at the end of this period, the time served becomes a part of the first year's apprenticeship, the entire period comprising four years.

The boys are transferred from one department to another, in order that they may learn each part of the work in the department where it is done, and they are also given training in many branches of the trade which are somewhat special in character, but help to give well rounded experience.

In one large American foundry as the result of the thorough training of apprentices under their own scheme it has been found that 14 or 20 per cent. are now holding executive or foremen positions, and that 13 or about the same percentage, technical positions. This shows that, in view of the fact that all these apprentice graduates are still young men, having in every case completed their apprenticeship since 1910, a very creditable number have found apprenticeship the first round of the ladder of industrial advancement. This may be accounted for in part by the careful selection of superior boys, who would have gone ahead anyway, but no doubt in part by the greater amount of supplementary school training than is provided in many schools. It is believed, however, that much credit should be laid to the fact that good apprenticeship during the sixteen-to-twenty age-period provides the discipline and industrial intelligence that, for the purpose, cannot well be acquired by other means. Of the remainder, many of these men with maturity will doubtless advance to positions of responsibility; but even though they do not, they are in highly useful and productive employment.

Under the general scheme suggested for the American foundries, a system of upgrading is to be adopted which, being divided into units, permits a broad training to gain general experience and knowledge. A very excellent plan is adopted under which a boy, and even a foreman, has to periodically answer a standard set of practical shop questions to show progress and proficiency. Under this scheme a boy starts as a worker in the cleaning department, follows as assistant to melter, and graduates on to the teaching of pouring, coremaking, machine moulding, bench moulding, side floor moulding, crane floor moulding, loam moulding, assembling, and finally takes heat treatment and annealing. Each of the above sections is subdivided for training purposes into materials, equipment, and operations.

A visit to some of the Continental foundries will bring home the difference between our system of training boys. Both in Belgium and France the boys are separate from the men, they are educated during working hours, every boy's record is known and recorded, he is taught not only how to do anything but also why it is best done in that particular way. The personal influence of the teaching and training of the older skilled man is such that it leaves an impression upon the lad's career. A Belgian manager has said that his boys were the best paying part of his foundry; he obtained from them not only good work but good workmen.

In general, apprenticeship systems are not looked upon as one of the means for improving industrial relations. Nevertheless, an intelligently conducted apprenticeship course does much to create a friendly feeling between employer and employé, not only for the present but for many years to come.

The Institution of Engineers (Scotland) have just issued an exhaustive report upon Apprentice Training, and recommend that the sandwich system is the best course to adopt.

"The Committee think that the 'Sandwich System,' under which apprentices spend part time in the workshop and part at school, should be encouraged in the case of apprentices. Those who train on this system should spend at least three and a half years in the workshop. The Committee strongly recommend the advantage of this system of combined theoretical and practical training as providing a young man with the best means of preparing himself for higher work in the engineering industry."

A German Scheme.

Possibly one of the best schemes for apprentice training is that of Ludwig, Loewe & Company. Extracts from their scheme are as follows:—

Apprenticeship extends over a period of four years, and takes in the following practical work:—

Moulders.—Sand cores, nine months. Loam cores, six months. Sand moulding, twelve months. Carpentry, three months. Large sand moulding, seventeen months. Testing and trimming, one month.

Loam Moulders.—Loam cores, six months. Carpentry, two months. Small loam moulding, twelve months. Large loam moulding, twenty-seven months. Testing and trimming, one month.

School Work.—Two afternoons a week—one from two to six and the other from four to six, extending over the whole period of four years.

First Year.—General intelligence, two hours.

Second Year.—Workshop, two hours.

Third Year.—Raw materials, two hours.

Fourth Year.—Foundry education.

This syllabus indicates that, while a considerable part of the time is occupied with work directly connected with the practical side of the foundry, the most important side of the education is the development of the true idea of citizenship and general intelligence.

In a book published by Reginald Bray some time ago, he defined an apprenticeship system as worthy of the name should satisfy the following three conditions:—

(1) Adequate supervision for boys up to 18 years; supervision must take into account conduct and physical development.

(2) Must offer opportunities of training both general and special; that is, the training of the citizen and the training of the workman.

(3) Provision of a suitable opening on completion of apprenticeship.

Finally, the author appeals to the proprietor, foreman, and apprentice to see that the educational equipment of a foundry apprentice is equal to that of apprentices of other branches of the engineering trade. Employers should see that certain instruction is given in the foundry, as it is the only place where such instruction can be given. Some standard diploma for all grades of the workers should be organised, as this would provide an incentive and add dignity to the calling. Foundry workers are thirsting for education of the right kind and "served up properly." The subjects must be interesting and understandable and given by somebody who is accustomed to the men. The personal element is all-important for success. The task is a joint one for the technical school and industry to carry on together by sympathetic and effective co-operation. This institution, as representative of the progressive spirit of the foundry industry, is the logical agency for inaugurating such a policy of co-operation that will enable the technical school to fulfil its largest mission.

Foundry Organisation for Costs and Records.

By P. C. Critchlow.

(*Continued from page 50.*)

Organisation of the Stores.

All requisitions on stores are made out in duplicate by the shop clerk and signed by the section foreman. One copy is retained by stores and the other copy by shop clerk for recording receipt of material on his production order. It is found policy not to allow material to lie about the shops, but to draw from stores as required. For this reason the group requisition was introduced. This is detailed in Fig. 7. The foreman first of all authorises the amount estimated, cut to a minimum, to cover his week's supply. Both copies of this requisition are taken to the stores by a messenger. The storekeeper signs the card for the amount given out, and the messenger signs the

FORM NO. 9. No

STORES REQUISITION.

Amount authorised..... Week ending".....

Dept. chargeable ..... Job. No.....

Material .....

Bin No.	Date	Quantity	C.	Q.	lbs.	Signature

.....Superintendent.

FIG. 7.—THIN CARD, WITH TISSUE, FOR WEEKLY USE

tissue. The tissue is retained in stores, and the card is returned to the shop clerk. When further material is required for that job, the messenger collects the group requisition card from the shop clerk, takes it to stores, and signs as before. The copies of the requisitions must be forwarded to the costs office at each week-end.

In the stores requisition number and department receiving the material are entered on to the proper bin card. The same procedure applies to requisitions for consumable stores and shop supplies.

STORES REQUISITION.

Dept. No. ..... Job. No..... Date .....

Bin No.	Description of Material	Quantity	Weight

Received by .....Foreman.

Only Requisition one class of Material on each form, Bin No. to be filled in by Storekeeper. To be filled in with Copying Ink Pencil.

FIG. 7A.—IS MADE IN DUPLICATE FOR SINGLE REQUIREMENTS

Requisitions to stores must be obtained only from the shop clerk, and the stores must refuse to issue goods not countersigned by him. This is important from the point of view of correct allocation, and also because it provides the shop clerk with the information required to post up the production order or the progress record at the back of the works order form.

The "returned to stores notes," productive material or defective, when returned to stores, follow the same procedure as the requisitions, but in reverse order, as set out in Fig. 8.

In the case of service motor cars and motor lorries a weekly requisition for petrol and oil is made out for each car or lorry. Personal or single requisitions for petrol and oil, etc., should not be permitted.

No requisitions of any type should be made out by the foremen or superintendents; they should authorise and sign the requisitions only, the shop

FORM NO. 8. No.

PRODUCTION MATERIAL RETURNED TO STORE.

Dept. No. ..... Operation No.....

Part No. ..... Order No. .....

Bin No.	Date	Quantity	C.	Q.	lbs.	Signature
Total	Returns					

FIG 8.—CARD, WITH TISSUE, FOR WEEKLY USE.

clerk must make out all requisitions and "returned to stores notes," as all material received by and despatched from the shops has to be posted to the works orders for production records purposes from the actual notes used, and they must also balance with stores records. This can only be effectively carried out by the strict limitation of requisitions to shop clerk.

Both copies of stores requisitions are forwarded to the costs office. The same applies to "returned to stores notes," which are made out by the shop clerk, one copy of which he uses when writing off his production order.

MATERIALS RETURNED TO STORES.

Dept. No. ..... Job No..... Date .....

Bin No.	Description of Material	Quantity	Weight

Returned by.....Storekeeper.

Only Requisition one class of Material on each Form Bin No. to be filled in by Storekeeper. To be filled in with Copying Ink Pencil.

FIG. 8A.—IS MADE OUT IN DUPLICATE FOR SINGLE RETURNS.

It will be seen that stores can be checked by this procedure, and if properly carried out a continuous and up-to-date record of work in progress and location will be at hand. The fundamental points to be observed are:—(1) That time and materials be booked against the correct standing order or production order number, and service rendered; (2) that repairs, general labour, inspection, etc., with all consumable stores, be charged to the section or department for which the expense is incurred; (3) that all records and charges be made where and when the work is being done.

General Office Procedure.

The work time sheets received from the shop clerk supply all data required for costing. At the foundry under review all further analyses, etc., are done by mechanical means. The costing periods should be of two four weeks and one five weekly period per quarter. Monthly cost returns

are essential if a close grip is to be kept on current work, and should be the subject of discussion at a monthly meeting at which the general manager presides.

The earnings of each operator are accurately extended on the time sheets over all jobs on which he has worked, and from these are prepared wages analyses under the heading of "production order numbers" in each section; floor, machine, core, etc.

The non-productive wages are analysed under the standing order numbers to each department, and to general on-cost when the service has covered more than one department.

Items such as plant maintenance are not only shown in total amount but are divided over the shop or departments where the expense was incurred. This is important for correct allocation of on-cost. The wages analysis in total is agreed with the pay roll total each week.

manner, and it now remains to get details of the output against this.

The weight and number of castings produced by each man under order numbers will be set out from the work instruction card on to the time sheets.

The same information is to be found entered on the works order forms, and also will probably have been entered in a castings book in the foundry. At the factory under review, the summary of output is prepared to cover each monthly costing period from the time sheets and balance with the totals for the period shown in the castings book.

The production in weight and number of castings is analysed in the same manner as the wages under order numbers and under the departmental headings of floor-moulding, machine-moulding, bench-moulding, aluminium, and non-ferrous castings, etc.

The figures of the various records may be, and

BLAST.
Pressure .....
Started .....
Stopped .....
Time lost .....

CUPOLA CHARGE SHEET.

Date .....
Cupola No. .....
Inside Diar..... Inches .....
Furnaceman.....
Charger .....

IRON.....Cwts. Per charge. LIMESTONE.....Lbs. Per charge. COKE Per charge..... Cwts. Lighting up..... Cwts.

GRADES AND QUANTITIES OF IRON PER CHARGE IN CWTS. UNDER BIN NUMBERS.

MIXTURE.	Durham		Cleveland.		Durham Foundry	Northumberland	Northampton-shire	Northampton shire High Silicon.	Lincoln-shire	Scotland.		Northampton-shire Basic.		SCRAP.			
			No. 1	No. 3		Forge.				No. 1	No. 3			Hematite.	Machine	Common light.	Foundry
A																	
B																	
C																	
D																	
E																	
F																	

CROSS OUT A NUMBER FOR EACH CHARGE MADE.

A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
B	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	22
E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

LAST IRON DOWN.....

REMARKS :—

	T.	C.	Q.	Lbs.	For Office Use Only.	T.	C.	Q.	Lbs.
Total Weight Good Castings ..					Total Weight Charged				
,, ,, Scrap					Less Total Melt				
,, ,, Run Off Unused ..					Loss in Melting				
Total Melt									

FIG. 9.—THE CUPOLA CHARGE SHEET.

The total wages are thus summarised in monthly abstracts under the various production orders, standing orders, and departments for which the work is done.

The stores requisitions are treated monthly in a similar manner, with the result that shop expenditure in wages and materials is properly analysed under:—(*a*) Productive material which is charged to the job. This occurs only where the work includes fitting up with such things as bolts, etc. (*b*) Productive wages are charged to order numbers with a separate total for each section of the foundry. (*c*) Maintenance wages charged to department or shop. (*d*) General service wages charged to department or shop. (*e*) On-cost material, including maintenance, building, plant, tools, shop supplies, etc., used for any section or department.

For purposes of accurate on-cost charges all expenditure is charged at the point where the expense occurs, and the detailed analysis gives the debit to the exact job or shop.

The abstracts of wages and materials are summarised into monthly totals, which form the posting medium to the cost cards and cost ledgers, and provide stores ledger credits.

The expenditure has been obtained in this should be, verified at the several different points. The total output calculated by the monthly analysis of production can be compared with the foundry castings book, and also with the weight of castings dispatched after allowing for work put in progress or stock. This weight must also balance with the output, as shown at the foot of the cupola charge sheets for the month.

Wages expenditure is verified by the pay roll. Ledger accounts and direct issues are in accordance with bought and nominal ledgers.

The continuous stock-taking ensures the accuracy of metal and other material charges of all descriptions as covered by the requisitions on the stores.

Metals and Melting Charges.

It is obvious, of course, that metal used cannot be placed against a specific job as the cupola melt is the unit. A cupola charge card, shown in Fig. 9, is issued, a card being confined to one cupola. These should be prepared, if possible, on the day before the metal is required, showing the mixture to be used, classified in accordance with the alphabetical code. The top copy of the card is sent to stores, one copy is retained in the foundry office, and the card itself is forwarded to the cupola attendant.

The storekeeper accepts his copy as a requisition, and the stock-keeper weighs and issues to the cupola the necessary materials in metal, limestone, and coke as stipulated.

As each charge is loaded into the cupola, the cupola attendant crosses out a figure under the proper heading of pig-iron or scrap iron, and in line with the specific mixture as shown by the code letter.

At the close of the shift the card is returned to the foundry office and completed in accordance with the details as required, *i.e.*, for each day the total output is shown at the foot in terms of (*a*) the weight of good and (*b*) defective castings; (*c*) the weight of metal run off unused in gates, runners, etc., which is received back as scrap, and (*d*) the melting loss. The sum of these will, of course, equal in aggregate the total weight of metals charged into the cupola.

For different types of castings, separate cupola expense records are kept distinct and apart from ordinary melt.

The daily cupola charge cards are totalled for each costing period, which gives the amount and qualities of metal used. Added to this are cupola wages, repairs, and other incidental charges, including any expenditure rightly applicable to melting costs from maintenance and service accounts and a percentage from general on-cost for depreciation, etc., on cupolas. In this way all charges on metals and expenses of melting are brought together. Scrap value is allowed for returns by defective castings, gates, and runners sent back as foundry scrap. The balance divided by the output in good castings in any section gives the metal cost per cwt. run into castings which is the metal rate for the month posted on to the job cards and extended against the weight produced for any order.

The procedure will apply to all metals, and a separate account of each type and nature will be opened in the costs ledgers.

All pig-iron and scrap, whether purchased or returned from foundry, is taken on the stores charge. As the daily cupola charge cards are treated as requisitions, the metal accounts in stores ledgers are credited therefrom in monthly totals. The balances are stock, and the correctness of the stock when physically taken reveals the degree of accuracy in the cupola charge sheets.

FOUNDRY.—JOB COST CARD.

ORDER NO.

NO.

Week ending	Wages			Monthly			Total			Good castings	Each		Per cwt.	
Direct O/C.			%											
General O/C.			%											
Metal per Cwt.														
CASTINGS:														
Good														
Defective														

FIG. 10.—FOUNDRY JOB CARD, CONTAINING SIX SECTIONS, THREE ON EACH SIDE, SIMILAR TO THE ONE SHOWN.

Cost Cards.

A cost card, the details of which are given in Fig. 10, is written up for each job. This lasts six months. Each month the wages amount as expended on the job is transferred to the card for the monthly abstract, the on-cost percentage is applied, and the value of metal used is extended in accordance with the rate per cwt. or per lb., as shown by the metal and melting account.

The cost card, it will be observed, shows the varying price per month, both per cwt. and per casting, and also the scrap made on the job.

It will also reveal the progress of the job at any time during its period of production and show the full cost at the close of the order.

The Institute of Metals.

The annual meeting of the Institute will be held in London on March 8—9, when some important Papers are to be presented for discussion. At the annual dinner at the Trocadero Restaurant on March 8 lady members, as well as many distinguished guests of the Council, will be present.

Prior to the March meeting, a ballot for the election of new members and student members will be held. The necessary membership application forms, combined with an interesting illustrated booklet describing the work of the Institute, and including photographs of all Past-Presidents, can be obtained from the Secretary, Mr. G. Shaw Scott, M.Sc., 14, Members' Mansions, Victoria Street, Westminster, S.W.1, to whom application forms, duly completed, should be sent not later than noon, February 22. A special feature which makes the ballot the most notable of the year, is that persons elected as a result of it secure membership, not for the usual twelve months, but for the extended period ending June 30, 1923, as well as an extra volume of the Institute's Journal.

The annual May Lecture will be delivered on May 3 by Sir Ernest Rutherford, F.R.S., on "The Relation of the Elements." The discourse should throw fresh light on the much-debated subject of the possible transmutation of metals.

The autumn meeting of the Institute will be held at Swansea on September 20-22. A large gathering is expected.

From October to December (as well as during the present quarter) meetings of the various local sections of the Institute—membership of which is free to members of the parent body—will be held in London, Birmingham, Sheffield, Glasgow, Newcastle-on-Tyne, and elsewhere.

In view of the attractive nature of the programme of the Institute of Metals for the ensuing year, it is expected that the growth of the Institute in 1922 will be even greater than it was last year, when the membership increased from 1,298 to 1,410—a record year's growth. Such an increase, occurring during a year of great trade depression, indicates that makers and users of non-ferrous metals and alloys, are now more than ever alert to take advantage of the scientific information obtainable through association with the Institute that exists to foster their interests. It is largely through the adoption of more scientific methods of manufacture that the British manufacturer will be able successfully to meet foreign competition, and it is just here that invaluable service is being rendered by our scientific institutions. When trade was good some makers imagined that they could afford to ignore such assistance, but to-day no stone is being left unturned to advance the technics of industry—hence the "boom" in the Institute of Metals' membership.

ALFRED HOLT & COMPANY, of Liverpool, have placed with Cammell, Laird & Company, Limited, Birkenhead, an order for a 11,000-ton twin-screw turbine composite cargo and passenger boat.

Trade Talk.

Two furnaces are to be re-lighted very shortly at the Swansea Vale Spelter Works.

MYLAN & SMITH (ENGINEERS), LIMITED, have removed to Kelvin House, St. James Street, Sheffield.

JOHNSTON & GILMOUR, 606, Eglinton Street, Glasgow, are the sole representatives in Scotland for the British Rawhide Belting Company, Limited.

THE ELECTRIC LOCOMOTION AND FOUNDRY COMPANY, LIMITED, Gateshead, are supplying an electric storage-battery locomotive to the Glasgow Corporation.

BURTON, GRIFFITHS & COMPANY, LIMITED, 70, Vauxhall Bridge Road, London, S.W., have been appointed British agents for the Toledo Machine & Tool Company, Toledo, Ohio, U.S.A.

IT IS REPORTED that the ship-repairing industry on the Tyne shows a considerable improvement. Several vessels are due for repairs, and work has been resumed already on two large vessels in one shipyard.

ON Friday last the members of the Staffordshire Iron and Steel Institute met at the Education Offices, Dudley, when a Paper was read by Mr. H. W. Wolton on "Electric Welding."

MR. WILLIAM STEAD, Duchy Chambers, Clarence Street, Manchester, has relinquished the representation for the North of England of the Societe Anonyme Les Nouvelles Usines, Bollinckx, Bruxelles.

A PAPER by Mr. W. H. Casmey, of Holdsworth & Sons, Limited, on the subject of "Aids to Coal Economy," is being read before the twenty-six branches of the National Engineers' Association.

THE business carried on hitherto by the British, Irish and Colonial Department of the Ateliers de Construction Oerlikon has been transferred to Oerlikon, Limited, Oswaldestre House, Norfolk Street, Strand.

LAST Friday Mr. F. E. Hurst read his Paper before the members of the West of Scotland Iron and Steel Institute on "Centrifugal Castings." The meeting was held at the Royal Technical College, Glasgow.

MR. FRANKLIN SMITH, President of the Osborn Moulding Machine Manufacturing Company, and the American Foundry Equipment Manufacturers' Association, is due to arrive in this country early next month.

THE NATIONAL COUNCIL OF THE COMMERCIAL MOTOR USERS' ASSOCIATION, at a meeting in London on February 1, will consider the question of pressing for an all-round reduction of motor taxation in the next Finance Act.

IT IS OFFICIALLY ANNOUNCED that Swansea is to have a new dry dock, which is to be constructed by the Jarrow Shipbuilding Company, near the breakwater. The new dock will be 710 ft. long, and will be one of the largest dry docks in the country.

SIR WILLIAM NOBLE, President of the North-East Coast Institution of Engineers and Shipbuilders, revived a pre-war function at Newcastle recently, in giving a reception and dance. There were about 800 guests, who were received by Sir William and Lady Noble.

THE MONOMETER MANUFACTURING COMPANY (1918), LIMITED, have organised a company in France for the sales of heating furnaces, die casting machines, temperature controllers, etc. This company will have the sole selling rights for both France and Belgium for the products controlled by the Monometer Company.

MESSRS. WORKMAN CLARK & COMPANY, LIMITED, on January 14, launched from their South yard the turbine steamship "Diomed." The vessel, which is 490 ft. in length and has a gross tonnage of about 10,305 tons, has been built to the order of Alfred Holt & Company for its China Mutual Steam Navigation Company.

THE first general meeting of the West Yorkshire Metallurgical Society will be held at the Y.M.C.A., Huddersfield, on Saturday, January 28. The president, Mr. T. E. Hull, will deliver the opening address, and a debate will take place on the motion: "That physical testing is the duty of the metallurgist rather than the engineer."

THE DEPARTMENT OF OVERSEAS TRADE is informed by the Legation in London that the Bulgarian Postal Authorities invite tenders for the supply of 3,000 junction pieces for batteries, 5,000 kgs. lead, and 50 kgs. solder ("etain au colofane"). Tenders on March 27 to the District Office of Finance, Rue Rakovski 102, Sofia.

THE FULL REPORT of the general discussion on the "Failure of Metals under Internal and Prolonged Stress," at the meeting held jointly by the Faraday Society, the Institution of Mechanical Engineers, the Iron and Steel Institute, the Institute of Metals, the North-East Coast Institution of Engineers and Shipbuilders, the West of Scotland Iron and Steel Institute, and the Institution of Engineers and Shipbuilders in Scotland, on Wednesday, April 6, 1921, has now been issued in book form at the price of 10s. 6d. net. To members of the above Societies the price has been reduced to 6s. net.

SIR R. HORNE, writing to the Lord Provost of Glasgow on the suspended warship contracts, said they would realise that it would be foolish for the Government to embark upon making any material for which there was no market. It was therefore very difficult to see in what direction the Government could create work in substitution.

THE LANARKSHIRE STEEL COMPANY, LIMITED, Motherwell, have decided to resume work in their mills in the course of the next two or three weeks. In normal times the Lanarkshire Company employ something like 2,500 men, and although this number cannot be found immediate employment, it is thought that a good proportion will be taken on.

MR. L. ROBINSON has taken into partnership Mr. W. E. Warrilow, and in future will trade under the name of Lionel Robinson & Company. The company will continue at 3, Staple Inn, London, W.C.1, the sole agency for resistance materials and wires of Henry Wiggin & Company, Limited, Birmingham.

THE UNDERFEED STOKER COMPANY, LIMITED, are supplying the Nottingham and Belfast Corporations with 18 and 12 travelling grate stokers respectively. Other orders include one travelling grate for the Tokio Exhibition, and ash conveyors for the Wolverhampton Corporation, the State Electricity Commissioners at Victoria (N.S.W.), and the Kure Arsenal, Japan.

THE NON-FERROUS METAL MERCHANTS' SECTION of the Birmingham Exchange, at a committee meeting held on January 17, presided over by Mr. F. W. Harris, decided to make further representations to the railway companies on the question of railway rates. Merchants are agreed that the scrap metal business is being very seriously handicapped owing to obstacles placed in the way of internal trade by the excessive railway rates.

OPERATIONS on a greatly reduced scale were recently foreshadowed by the directors of the Broken Hill Proprietary Company, which has established an iron and steel industry in Australia, but is hit by foreign competition. The resumption of work in connection with the steel plant and rail mill is accounted for by the fact that the company has some orders on hand for these departments, which will be kept going for the short time necessary to complete the orders.

H.M. TRADE COMMISSIONER in Toronto (Mr. F. W. Field) reports that arrangements have been completed for the erection of a new hotel in a city in Eastern Canada, to cost $1,500,000, and suggests that manufacturers of ornamental iron work, builders' hardware, lifts and electrical equipment, etc., send catalogues and price lists to the architects in charge of the work. Particulars on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

TAYLOR & HUBBARD, Kent Street Works, Leicester; G. R. Turner, Limited, Langley Mill, Nottingham; McEwen, Denby & Hart-Briggs, Limited, Turret Works, Sunbury-on-Thames; North-West Rivet Bolt & Nut Factory, Limited, 105, West George Street, Glasgow; Frank Pearn & Company, Limited, West Gorton, Manchester; Gregson & Company, 80, Billiter Street, London, E.C.; and the St. James Engineering Company, Limited, 97, St. James Road, Glasgow, have joined the Federation of British Industries.

SEVEN members, headed by Mr. Manzo Kushidd, director of the Mitsu Bishi Bank, of the Japanese Commercial Mission, visited Swansea on the 16th inst., and were entertained by the metal interests of the town, the Swansea Chamber of Commerce and the Swansea Harbour Trust. The morning was spent in visits to the steel, tinplate, and galvanising works at Pontardawe, of Messrs. Gilbertson; to similar works owned by the Grovesend Steel & Tinplate Company, Gorseinon, and the British Mannesmann Tube Works, Swansea.

THE DANISH STATE RAILWAYS invite tenders for the supply and delivery free on truck alongside piers at the ports of Copenhagen or Aarhus for 305,000 fish-plate bolts (274 tons), 300,000 rail spikes (93 tons), 100,000 locking washers (7 tons), 400,000 clips (431 tons), and 250,000 holding-down plates for clips (26½ tons). Tenders to the Chefen for Baneafdelingen, Gl. Kongevej 13, Copenhagen B., not later than 3 p.m. on February 10. Particulars on application to the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W.1, Room 49, until January 28.

AT THE FOURTH annual dinner of the Refractories Association, held recently at Sheffield, under the chairmanship of the president, Mr. W. J. Gardner, some pertinent observations were made with regard to the position of the industries of the country as a whole, and of the silica brick and firebrick trades in particular. Mr. J. Holland said that there were two matters upon which the Government ought to keep a special eye. The one was taxation, and the other transport. As regards taxation, the industries of the country were having to bear a bigger weight than they could well carry.

IRON AND STEEL MARKETS.

Pig-iron.

The outlook in the pig-iron trade continues fairly favourable to an early resumption of activity, and although improvement is necessarily slow, a steady increase in the volume of inquiries would appear to indicate some progress in the desired direction. So far as the Midlands are concerned, however, matters remain as previously reported, the small amount of business passing relating mostly to unimportant orders for foundry pig, which smelters can easily supply from stocks in bulk In South Staffordshire also there is but a limited sale for forge iron, the demand for this quality being restricted by the quiet conditions now prevailing in the finished iron section. In the meantime quotations for Midland iron show a weakening tendency, and the prices actually realised are difficult to determine, it being almost impossible to give a definite idea of the lowest figure accepted when the market is tested. There are now only nine furnaces in blast in Scotland, and from reports to hand it would appear that demands in that area are insufficient to absorb outputs. On Tees-side prospects are distinctly better, fair sized parcels of Cleveland foundry iron having been sold to Scotland, a few small lots have been taken up by foreign consumers, while there is a steady flow of East Coast hematite to Welsh ports, and an improved demand for ferro-manganese. All these are hopeful signs, but they do not warrant an easy optimism, for even yet the total volume of business is very restricted, and we are still far from a general return to normal activity. It is now understood that the export premium on Cleveland iron has been abandoned, prices being firmly held at the official minima—viz., No. 1 Cleveland and silicious 95s., No. 3 Cleveland G.M.B. 90s., No. 4 foundry 87s. 6d., No. 4 forge 82s. 6d. per ton, and in mottled and white iron is there any cutting of prices, these low qualities being offered at 80s. per ton.

Better reports from Sheffield point to an improved demand from that source for East Coast hematite. On the other hand, five hematite furnaces being blown in in South Wales seems likely to restrict the very considerable business which has recently been done with that area, and East Coast hematite makers are very keen to secure orders. At present 97s. 6d. is still the nominal figure for mixed numbers, but buyers are not inclined to pay that figure, and for reasonable quantities sellers are quite prepared to meet them in the matter of price. There has been no change in West Coast hematite, quotations still ruling £6 5s. per ton for mixed numbers delivered Sheffield.

Finished Iron.

However much might have been hoped by the more optimistic section of the finished iron trade that some improvement would have followed the recent quarterly meeting at Birmingham, it has been completely disappointed so far, the business passing in this class of material being almost solely confined to comparatively insignificant quantities, mostly needed for urgent requirements. The marked bar houses are, perhaps, an exception to the general depression, there still being a fair market for this superior quality product. On the other hand, makers of crown and commoner brands of bars are confronted by a position of great difficulty, price undercutting by the non-associated firms being reported, in many cases diverting business to a disconcerting extent. For example, it is said that South Staffordshire crown bars are being offered as low as £12, with commoner qualities at still less, while the official minimum remains at £13. Lancashire makers are even reported as selling bars for nut and bolt users at £11 15s., delivered Darlaston, a price at which, of course, Black Country producers cannot compete. In these conditions it is not surprising that many works are altogether idle, or only operating partially, while some producers even prefer to let their mills stand idle rather than incur heavy and continuous loss.

Steel.

The position in the steel industry at the present time may perhaps be best described as uncertain, although in some respects considerably more hopeful than could have been expected a few months ago. Some ground for an optimistic view in this direction may be based on a steady decline in costs of production, and consequently lower prices on the one hand, while on the other it can be argued that the world demand for steel has only been delayed by the chaotic conditions of finance in foreign countries, and must ultimately be filled, greatly to the advantage of home manufacturers. For example, renewals of railway materials of all descriptions are already much overdue, few of the usual contracts having been placed last year, and when they come into the market must place a large amount of work in the hands of Sheffield steel manufacturers Business in semi-products is also looking up, both basic and acid billets being in better demand, a report from Scotland stating that merchants in Glasgow have received inquiries for 3,000 tons of steel blooms and billets for shipment to Belgium. The reason advanced for the inquiry is the scarcity of coke in Belgium for pig-iron production. Export merchants in London also report better opportunities in foreign trade for steel makers, and though inquiries at present are only on a small scale, the number is said to be increasing. Bookings for garden and farm tools, which should now be active, are unsatisfactory so far, and a poor season is probable.

Scrap.

Business in scrap metal continues quiet, the demand for iron and steel material especially being restricted by the limited number of consumers' works in operation. At Cleveland there is only a moderate inquiry for steel turnings, borings and heavy steel scrap, but the business passing is of unimportant extent. The following are the current quotations :—Heavy steel scrap, 60s. ; steel turnings, 40s. to 41s. ; c.i. borings, 40s. ; cast-iron machinery scrap, in handy pieces, 80s. ; bushelling scrap, 60s ; heavy forge-iron scrap, 75s. to 80s.

Tinplates.

Business in the tinplate trade during the past week has again been on the quiet side, the few transactions recorded having been principally in stock plates and orders for near shipment. Spot lots were realising 19s. 9d. basis, but plates for, say, February-March could be bought at 19s. 3d. basis for coke finish, net cash, f.o.b. Wales. Unless matters improve several mills will have to close down. For wasters 38s. 6d. has been accepted for CW 28 by 20. Sellers are still asking 20s. for oil sizes, but there are few, if any, buyers at this. Terneplates are in quiet demand. Prices are easier, and 18s. 6d. is now generally quoted for approved specifications, delivery over the next couple of months.

Metals.

Copper.—The week's markets for standard copper opened with a steady tone, and although consumptive demand was again below average, in the absence of active selling, values were fairly maintained without change from Friday's closing prices. January was done at £65 5s., March £65 15s., April £65 15s., while refined qualities of metal were irregular, with electrolytic 20s. lower at £71 to £73, and wire bars advanced at £72 15s. to £73 10s. According to the London Metal Exchange returns, the stocks of copper (all kinds) in the Metal Exchange warehouses of the United Kingdom at the end of December amounted to 16,655 tons, compared with 19,094 tons at the end of November. Warehouse receipts during December were 2,287 tons, and deliveries 4,726 tons, compared with 2,237 tons and 5,677 tons respectively in November. Closing prices :—Cash : Wednesday, £64 7s. 6d. ; Thursday, £65 5s. ; Friday, £65 ; Monday, £65 ; Tuesday, £64 17s. 6d. Three months : Wednesday, £65 5s. ; Thursday, £66 2s. 6d. ; Friday, £65 15s. ; Monday, £65 15s. ; Tuesday, £65 12s. 6d.

Tin.—Cable advices of heavy sales of tin in Eastern markets had an adverse effect upon business on this side, which was marked early in the week by considerable speculative selling. Market movements consequently were somewhat erratic, and some rather violent fluctuations in values were recorded, realising of January and three months' metal being heavy throughout, while Monday's turnover was the largest so far this year, amounting to 1,150 tons. English ingots were also weaker, closing 70s. lower at £158 10s. The weekly return of tin stocks in London warehouses shows an increase of 274 tons to 4,926 tons, Liverpool stocks being 74 tons lighter at 2,026 tons. with Swansea unchanged at 10 tons. Closing prices : —Cash : Wednesday, £163 17s. 6d. ; Thursday, £163 15s. ; Friday, £162 12s. 6d. ; Monday, £158 15s. ; Tuesday, £158 10s. Three months : Wednesday, £165 15s. ; Thursday, £165 10s. ; Friday, £164 5s. ; Monday, £160 5s. ; Tuesday, £160.

Spelter.—Only a quiet business has been transacted this week in this metal, consumption now being on a very limited scale, with the result that prices show an increasing lower tendency. English spelter remains nominal at £28. Closing prices :—Wednesday, £26 15s. ; Thursday, £26 12s. 6d. ; Friday, £26 10s. ; Monday, £26 7s. 6d. ; Tuesday, £26 5s.

Lead.—No improvement can be noted in the market for soft foreign pig, prices having undergone a further set-back. This has been due to realisations and speculative selling, while large quantities of metal have been lent January to April on level terms. English closing prices :—Wednesday, £25 ; Thursday, £25 ; Friday, £25 ; Monday, £24 10s. ; Tuesday, £24 10s.

VICTOR HIRSCH,

Iron, Steel and Metal Merchant.

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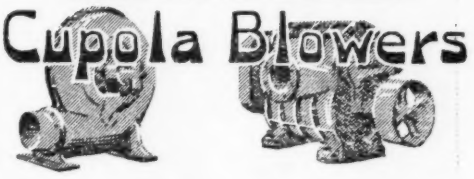

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Vide letter from Redditch.

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THESE letters speak for themselves. We should like to send you our latest catalogues F.T. 1023, Cupola Fans, and F.T. 1223, Rotary Blowers. Please ask for them.

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PLEASE REMEMBER:—
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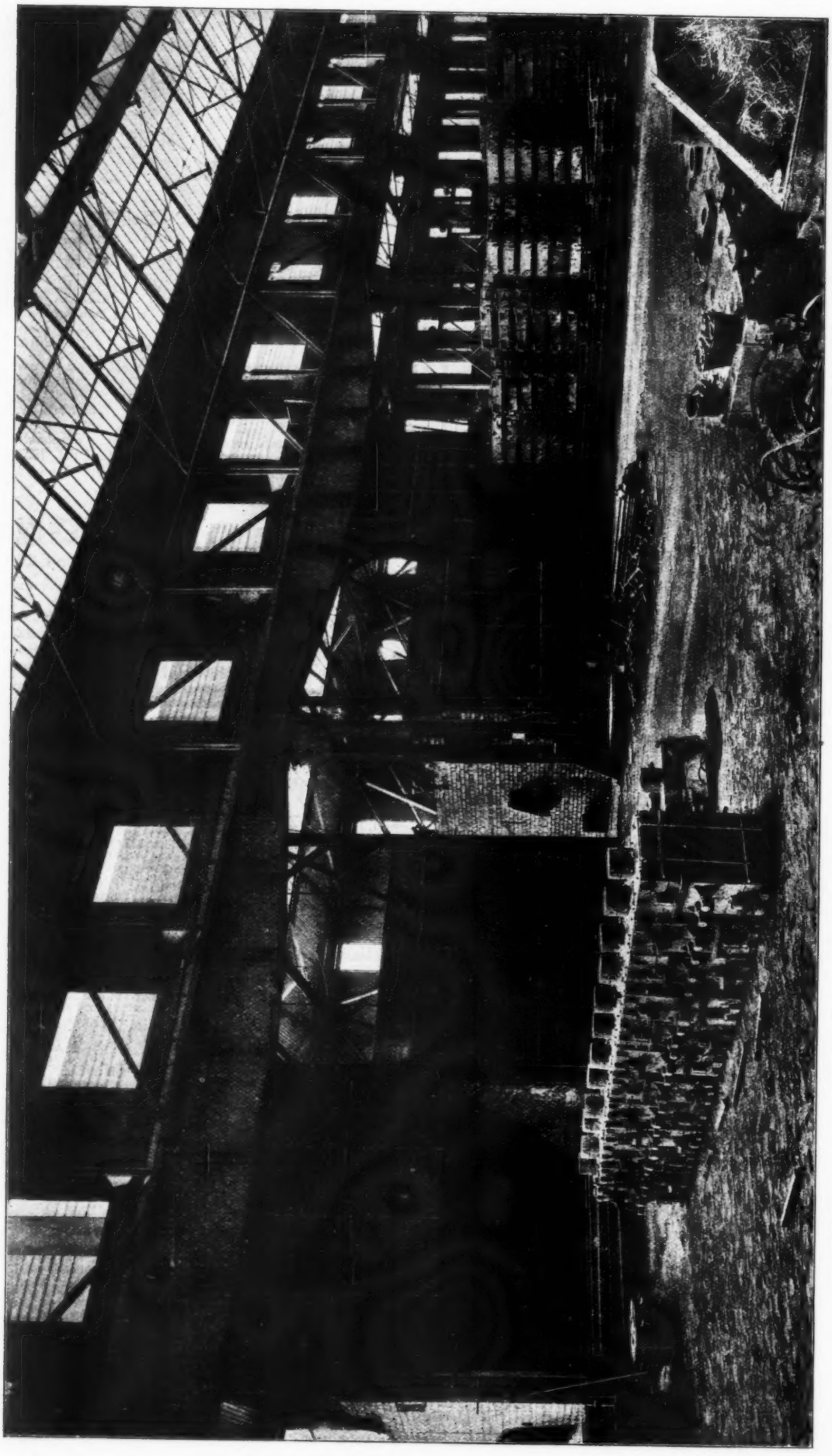

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